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DIVISION OF WATER POLLUTION CONTROL
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SPRINGFIELD, ILLINOIS 62706

1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

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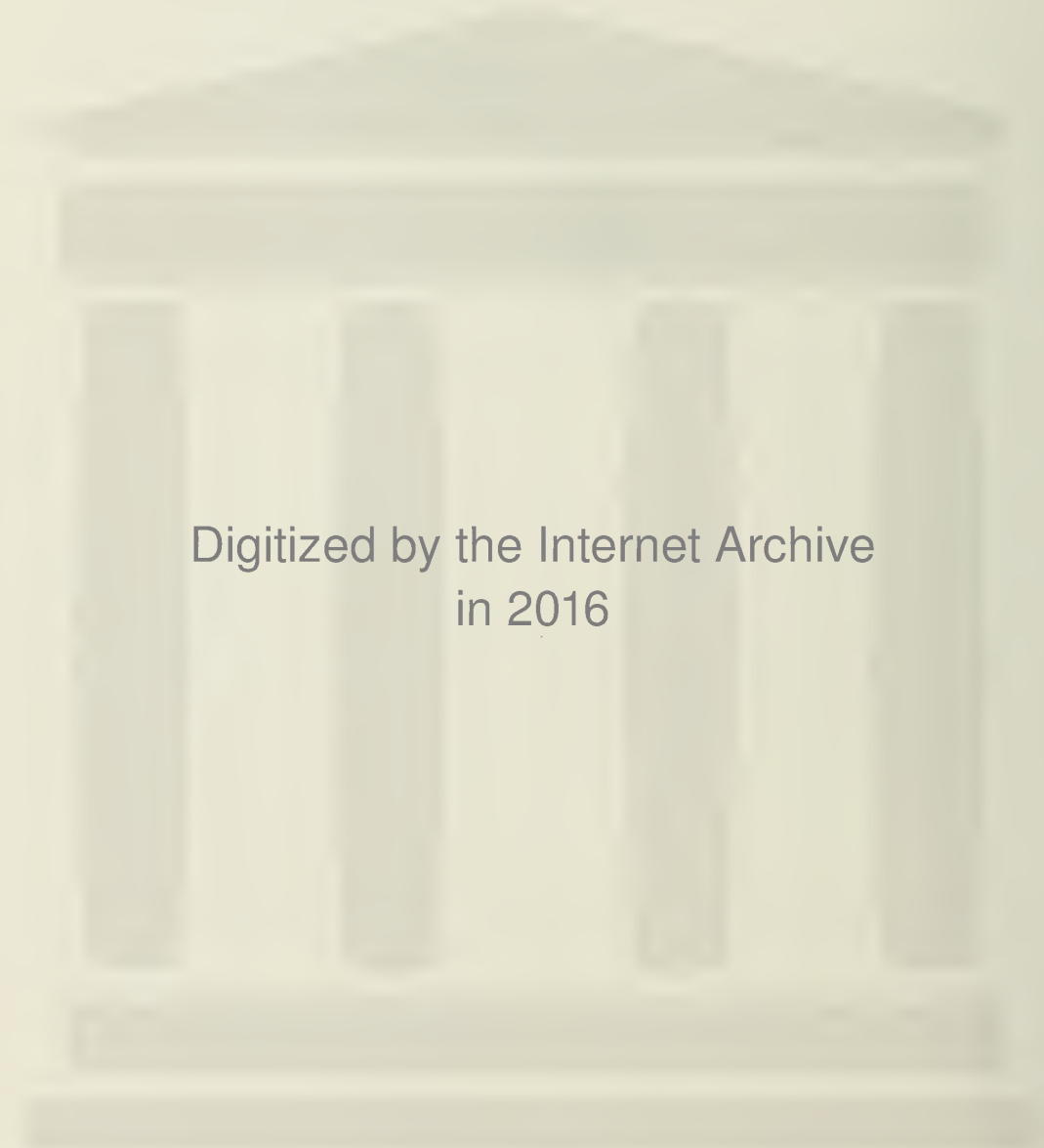
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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

THOMPSON FISHING CLUB LAKE, JACKSON COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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ACKNOWLEDGEMENTS

This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Thompson Fishing Club Lake is a 20 acre impoundment located in Jackson County, 2 miles west of Carbondale, Illinois. It is owned by Thompson Lake Fishing Club. The lake, which was constructed by damming an unnamed stream in 1957-1958, has a maximum depth of 25 feet, an average depth of 10 feet, and a storage capacity of 200 acre-feet (Table 1).

Thompson Fishing Club Lake is primarily a recreational lake used for fishing, row boating, canoeing, and waterfowl observations, and swimming. It also receives light use as a potable water supply. Access is limited to Club members and their guests.

The 75 acre watershed of Thompson Fishing Club Lake is estimated to be 35% row crops. The lake shoreline is primarily residential.

Suspended sediment, algal blooms and aquatic weeds are considered to be moderate problems for the lake. The fishing club is working with the Illinois Department of Conservation to control the aquatic weed problem. The lake is fertilized with triple super phosphate to create algal blooms to shade out the weeds. Cropland runoff, construction site runoff, fertilizer or pesticides from lawns, waterfowl, and sediment in the lake are cited as potential pollution sources.

TABLE 1. LAKE ASSESSMENT SUMMARY, THOMPSON LAKE, JACKSON COUNTY, ILLINOIS (RO-B03ZC).

I. GENERAL INFORMATION

River Basin: Kaskaskia
Segment: B03

Ownership: Thompson Lake Fishing Club

Surface Area (Acres): 20
Watershed Area (Acres): 75
Maximum Depth (Feet): 25
Average Depth (Feet): 10
Storage Capacity (Acre/Feet): 200
Inflowing Stream(s): no name
Outflowing Stream(s): tributary to Big Muddy
Water Retention Time:
Lake Type: dammed stream
Year Constructed: 1957-58

II. USAGE

Public Access: no-club members&guests only
Lake Usage:
- Potable Water Supply: light
- Industrial Water Supply: none
- Agricultural Water Supply: none
- Cooling Water: none
- Recreation:
  - Fishing: moderate
  - Swimming: light
  - Power Boating: light
  - Row Boating or Canoeing: moderate
  - Sailboating: lights
  - Camping: none
  - Picnicking: light
  - Waterfowl Hunting: none
  - Waterfowl Observation: moderate
  - Other:

Recreational Facilities:
sand beach, picnic shelter, no campground, no boat ramp, no concessions

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns):
- Golf Courses:
- Pasture or Grassland:
- Woodland:
- Row Crops:
- Wetland:
- Other:

Watershed Usage (Percent):
- Urban:
- Residential: 25
- Golf Courses:
- Pasture or Grassland: 25
- Woodland:
- Row Crops: 35
- Wetland: 5
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing: good
Conditions and Extent:
- Suspended Sediment: moderate
- Deposition of Sediment: slight
- Algal Blooms: moderate
- Aquatic Weeds: moderate-problem every spring
- Taste and/or Odor: slight
- Water Level Fluctuation: slight
- Fishkills: minimal
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage:
- Septic Tanks:
- Pasture or Grassland Runoff: yes
- Cropland Runoff: yes
- Feedlot Runoff:
- Construction Site Runoff: yes
- Fertilizer or Pesticides from Lawns/Golf Courses: yes
- Orchards:
- Forestry Operations Runoff:
- Mining:
- Waterfowl: yes
- Sediment in Lake: yes
- Other:

V. LAKE MANAGEMENT

Comments: Chemicals were used for several years to control plant growth; now working with IL. Dept. of Conservation in a super phosphate fertilization program.

Information Supplied By A. Frank Bridges (1981)

Assessment and monitoring information on Thompson Fishing Club Lake was provided by A. Frank Bridges, secretary of the Fishing Club. Secchi disc depth, total depth, and field observations were recorded at three sites (located in Fig. 1) on 11 dates in 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Thompson Fishing Club Lake are summarized in Table 2 and plotted in Fig. 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Raccoon Lake

The average Secchi disc transparency of Thompson Fishing Club Lake was 26.4 inches, which ranked number 52 when the average transparencies of volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and complatible with most recreational uses.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Thompson Lake ranged from a maximum of 78 inches at Site 3 on April 24 to a minimum of 12 inches at Site 1 on August 26. Transparency was similar at all three sampling sites.

The lake was clear, with transparencies from 5.5 to 6.5 feet (greater than the minimum of four feet recommended for swimming) during the April 24 sampling. On April 27, on the recommendation of the Illinois Department of Conservation Fishery Biologist, a program of fertilization with triple super phosphate was instituted as a means of controlling nuisance aquatic weeds. Approximately 100 lbs. of triple super phosphate was added to the lake on each of seven different occasions from April through July. This fertilization caused accelerated eutrophication of the lake and resulted in algal blooms (field observations noted green water color) which reduced the visibility to 3-3.5 feet by May 29 (half of what it was a month earlier) and to between 1 and 2.5 feet the rest of the summer (one-fourth to one-third of what it was in April). The phosphate treatments apparently served the purpose, as aquatic weeds were minimal during most of the summer.

FIGURE 1

THOMPSON LAKE

JACKSON COUNTY

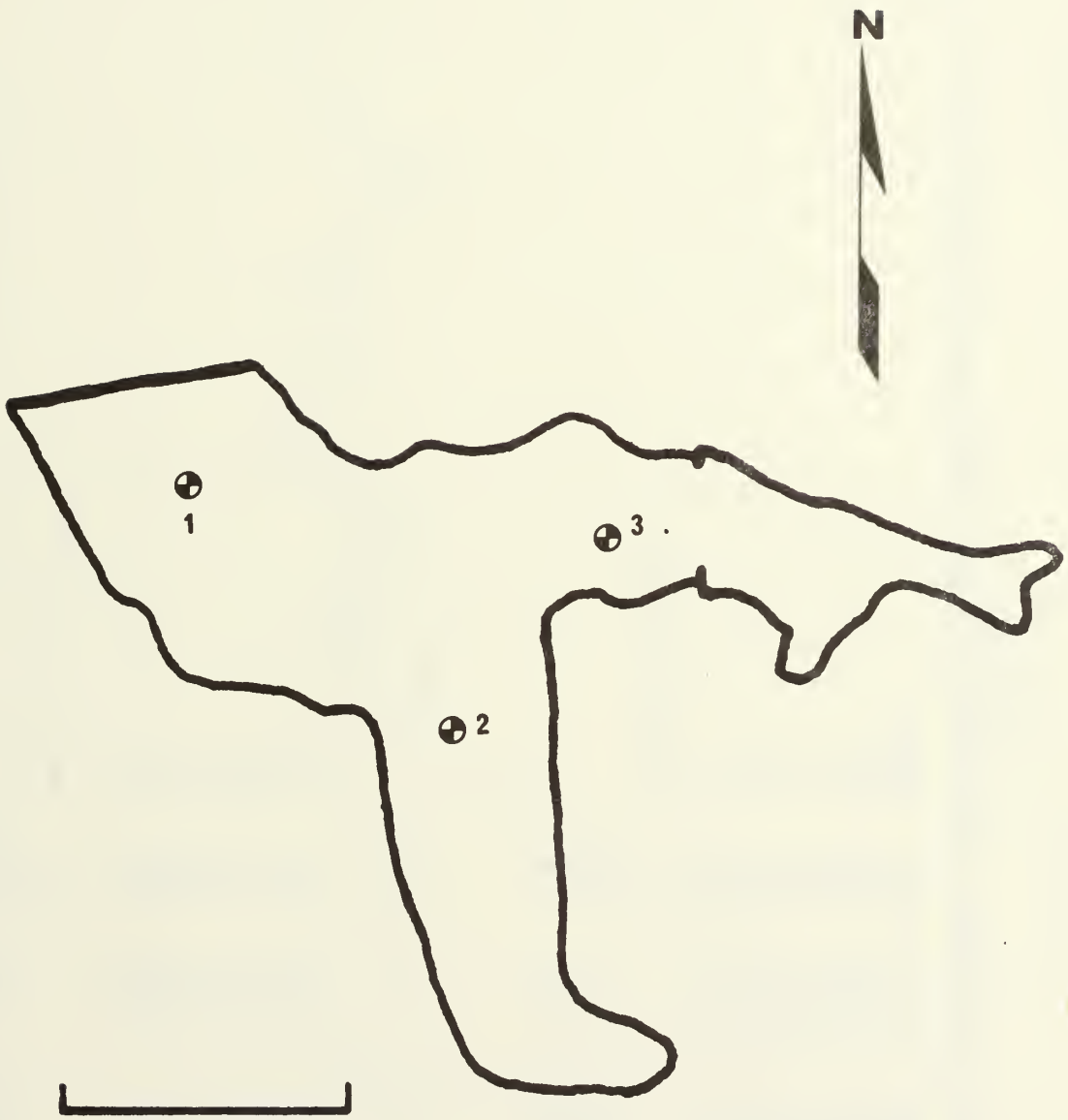


TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) THOMPSON F.C./JACKSON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 24	72.0	66.0	78.0	72.0	6.0
05/ 29	30.0	36.0	42.0	30.0	3.0
06/ 15	24.0	21.0	18.0	21.0	3.0
06/ 30	18.0	18.0	20.0	18.7	1.2
07/ 13	30.0	24.0	24.0	26.0	3.5
07/ 29	15.0	15.0	12.0	14.0	1.7
08/ 15	21.0	18.0	18.0	19.0	1.7
08/ 26	12.0	18.0	20.0	16.7	4.2
09/ 14	30.0	30.0	24.0	28.0	3.5
09/ 30	18.0	18.0	18.0	18.0	0.0
10/ 11	18.0	18.0	18.0	18.0	0.0

SUMMARY STATISTICS

	SITES			LAKE
MEAN	27.0	25.6	26.5	26.4
STD DEV	16.9	14.8	18.7	16.3
MIN	12.0	15.0	12.0	12.0
MAX	72.0	66.0	78.0	78.0
AV DEPTH	19.4	11.8	11.8	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) THOMPSON F.C./JACKSON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 24	18.0	11.0	11.0	13.3	4.0
05/ 29	20.0	12.5	13.0	15.2	4.2
06/ 15	21.0	12.0	10.0	14.3	5.9
06/ 30	18.5	11.0	13.0	14.2	3.9
07/ 13	18.5	11.0	13.0	14.2	3.9
07/ 29	20.5	13.0	12.0	15.2	4.6
08/ 15	20.0	12.5	13.5	15.3	4.1
08/ 26	19.0	12.0	12.5	14.5	3.9
09/ 14	20.0	11.5	12.0	14.5	4.8
09/ 30	19.0	12.0	10.0	13.7	4.7
10/ 11	19.0	11.0	10.0	13.3	4.9

SUMMARY STATISTICS

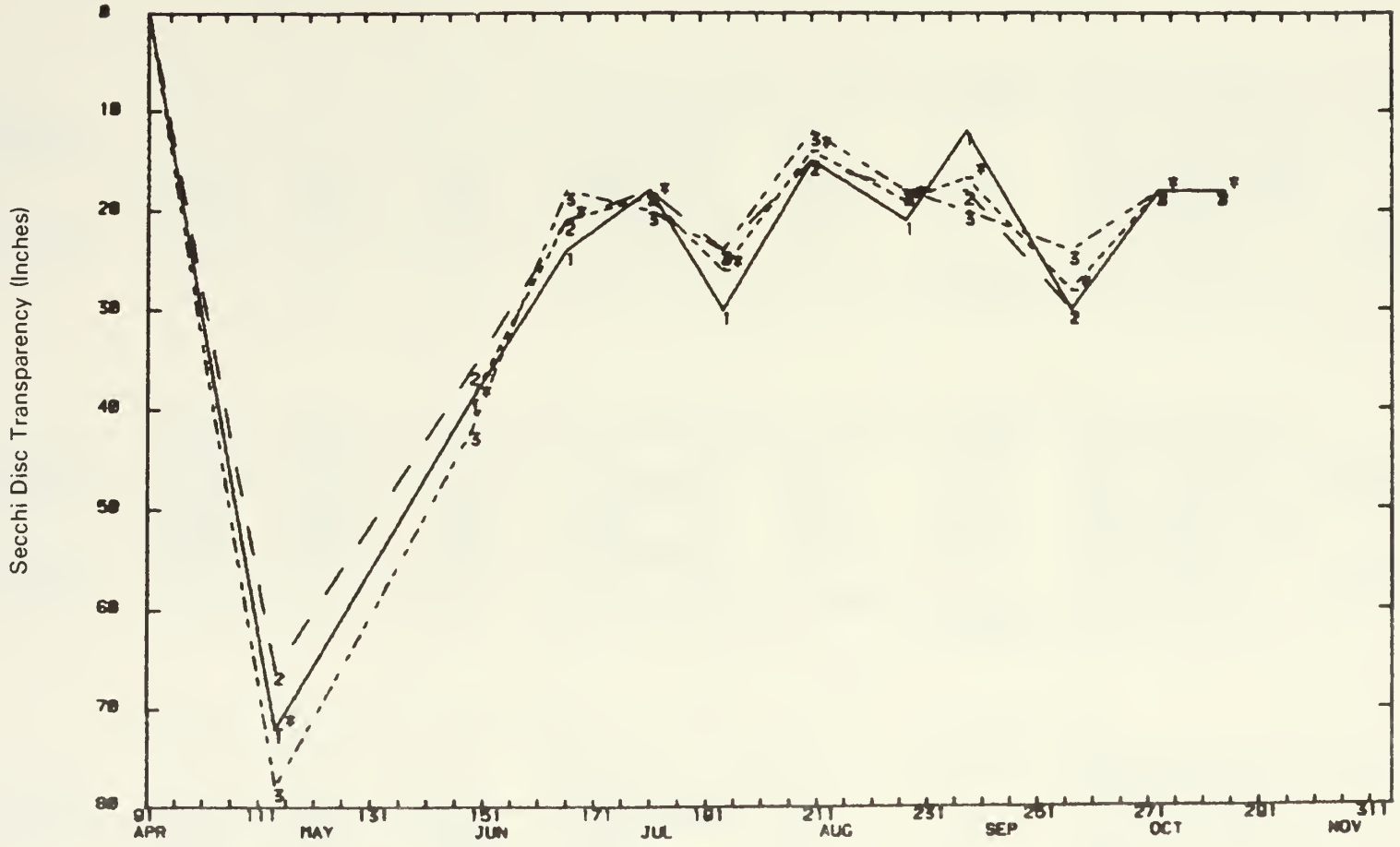
	SITES			LAKE
MEAN	19.4	11.8	11.8	14.3
STD DEV	0.9	0.7	1.3	3.8
MIN	18.0	11.0	10.0	10.0
MAX	21.0	13.0	13.5	21.0
AV DEPTH	19.4	11.8	11.8	

-1 = missing values

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) THOMPSON F.C./JACKSON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



KEY

1 Site 1
2 Site 2
3 Site 3
• Mean (Average)

TABLE 4. FIELD OBSERVATIONS, THOMPSON, JACKSON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/29/81	WATER COLOR:	lt. green	lt. green	lt. green
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	slight	slight	slight
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	moderate	moderate	moderate
	OTHER SUBSTANCES:			
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	few clouds	clear
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		

OBSERVATIONS MADE BY: A. Frank Bridges

OTHER COMMENTS

WATER LEVEL OF LAKE: level with spillway
RECREATIONAL USAGE: fishing, row boating/canoeing

LAKE MANAGEMENT: 4/27 & 5/8 Triple phosphate fertilizer to control vegetation

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/15/81	WATER COLOR:	lt. green	mod. green	mod. green
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	"clippings" duckweed	"clippings" duckweed	"clippings" duckweed
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	few clouds	hazy
PRECIPITATION:	no rain	no rain
WAVES:	small	ripple
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:	SW/NE	SW/NE

OBSERVATIONS MADE BY: A. Frank Bridges

OTHER COMMENTS

WATER LEVEL OF LAKE: even with spillway
RECREATIONAL USAGE: fishing, power boating

LAKE MANAGEMENT: none since last report

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/30/81	WATER COLOR;	lt. green	lt. green	lt. green
	SEDIMENT:	slight	slight	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:	dead fish	dead fish	dead fish
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	ripple	calm
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:	SW	SW

OBSERVATIONS MADE BY: A. Frank Bridges

OTHER COMMENTS

WATER LEVEL OF LAKE: 1" below spillway
RECREATIONAL USAGE: swimming, row boating/canoeing

LAKE MANAGEMENT: Super phosphate 2 treatment, approx. 100# each time.

ADDITIONAL COMMENTS: to control plant life

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
7/13/81	WATER COLOR:	lt. green	lt. green	lt. greet
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	"clippings" waterfowl	"clippings" waterfowl	"clippings" waterfowl
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	ripple	calm
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:	NW	SW

OBSERVATIONS MADE BY: A. Frank Bridges

OTHER COMMENTS

WATER LEVEL OF LAKE: normal level with spillway
RECREATIONAL USAGE: fishing, swimming, row boating/canoeing

LAKE MANAGEMENT: 7/11/81 100 lbs. Super phosphate to control vegetation & algae.

ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, THOMPSON LAKE, JACKSON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/29/81	WATER COLOR:	mod. green	mod. green	mod. green	CLOUD COVER:	many clouds	few clouds	WATER LEVEL OF LAKE:
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	heavy rain	RECREATIONAL USAGE: fishing, swimming row boating/canoeing
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	small	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	hot	LAKE MANAGEMENT: 7/15/81 100 lbs. Super phosphate to control vegetation
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	SW	NE	
	OTHER SUBSTANCES:	duckweed waterfowl	duckweed waterfowl	duckweed waterfowl	OBSERVATIONS MADE BY:	A. Frank Bridges		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/15/81	WATER COLOR:	lt. green	lt. green	lt. green	CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE:
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	mod. rain	no rain	RECREATIONAL USAGE: fishing, swimming, row boating/canoeing
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	calm	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	slight	slight	slight	WIND DIRECTION:	NW	S	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	waterfowl	waterfowl	waterfowl	OBSERVATIONS MADE BY:	A. Frank Bridges		ADDITIONAL COMMENTS: Lake is free from algae, pond scum, water weeds
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/26/81	WATER COLOR;	lt. green	lt. green	lt. green	CLOUD COVER:	hazy	clear	WATER LEVEL OF LAKE: 2" below spillway
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	mod. rain	no rain	RECREATIONAL USAGE: fishing, swimming, row boating/canoeing
	ALGAE:	minimal	minimal	minimal	WAVES:	small	calm	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	hot	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	W	S	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	waterfowl	waterfowl	waterfowl	OBSERVATIONS MADE BY:	A. Frank Bridges		ADDITIONAL COMMENTS: Last treatment a month ago
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
9/14/81	WATER COLOR:	clear	clear	clear	CLOUD COVER:	hazy	clear	WATER LEVEL OF LAKE:
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, swimming, row boating/canoeing
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	calm	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	hot	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	SE	S	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:				OBSERVATIONS MADE BY:	A. Frank Bridges		ADDITIONAL COMMENTS: Lake is in excellent condition
	ODOR:	no odor	no odor	no odor				

TABLE 4. FIELD OBSERVATIONS, THOMPSON LAKE, JACKSON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
9/30/81	WATER COLOR:	clear	clear	clear	CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE:	12" below normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE:	fishing
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	ripple		
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm		
	WEEDS NEAR SHORE:	moderate	moderate	moderate	WIND DIRECTION:	N	W	LAKE MANAGEMENT:	none
	OTHER SUBSTANCES:	none	none	non e					
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY:	A. Frank Bridges		ADDITIONAL COMMENTS:	

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
10/11/8	WATER COLOR:	clear	clear	clear	CLOUD COVER:	clear	hazy	WATER LEVEL OF LAKE:	18" below spillway
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	v. lt. rain	RECREATIONAL USAGE:	fishing, row boating/ canoeing
	ALGAE:	minimal	minimal	minimal	WAVES:				
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:				
	WEEDS NEAR SHORE:	moderate	moderate	moderate	WIND DIRECTION:			LAKE MANAGEMENT:	none
	OTHER SUBSTANCES:	duckweed waterfowl	duckweed waterfowl	duckweed waterfowl					
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:	

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR;				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The algal blooms resulting from the fertilization program reduced the euphotic (or lighted) zone of Thompson Lake to one-fourth to one-third of what it was in April (from about 11-13 feet to 3-5 feet). This resulted in the inhibition of aquatic weed growth by shading below depths of about 5 feet. Field observations indicated that weed growth was limited to the shallow shoreline areas. This reduction of the euphotic zone also means that, since the lake is deep enough to stratify, fish will probably not be found below about 5 feet due to lack of oxygen. Thus, fish habitat in Thompson Lake during the summer stratification has been reduced to about one-third of what it was previously. This serves to concentrate the fish in a smaller volume of water and will probably make them more catchable. It has also relieved the aquatic weed nuisance.

SUMMARY AND RECOMMENDATIONS

Summary

Thomspon Fishing Club Lake, a recreational impoundment in southern Illinois, was sampled on 11 dates between April 24 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer A. Frank Bridges recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Thompson Fishing Club Lake (26.4 inches) ranked 52nd of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). Although this average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Thompson Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Thompson Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae and weeds. Some eutrophication may be good and increase fish productivity and catchability, however, there are problems associated with the accelerated eutrophication brought about by the fertilization program. Some of these problems are already evident. The usability of the lake for swimming is now impaired as it does not meet the Illinois Department of Public Health criteria for swimming. Its aesthetic value has decreased. Its use as a potable water supply may also be impaired, as algae (particularly the blue-green kinds resulting from accelerated eutrophication) are known to cause taste and odor problems in drinking water. Fertilization to stimulate the growth of planktonic algae causes a significant volume of the water to become anaerobic and unavailable to the fish. It may cause stress conditions in the lake.

It is recognized that aquatic plants can be a nuisance when overabundant. They can impair recreational use and cause overpopulation and stunting of fish. However, they do provide important habitat for fish and fish food organisms, so it is important not to completely eliminate them from the lake. By fertilization, the aquatic weed problem is being replaced by another, maybe more serious, problem. Certain algae can release toxic substances into the water. Their decomposition robs the water of oxygen. If a series of cloudy days occur after an algal bloom, a massive algal dieoff could occur and deplete the oxygen from the lake, resulting in fishkills.

Recommendations

The Illinois Pollution Control Board has established a total phosphorus standard of 0.05 mg/1. This level is considered the upper limit to assure that serious nuisance algal blooms do not occur. If a lake is being fertilized with triple super phosphate (TSP), a maximum application rate of less than 0.3 lbs per acre/foot should be used to get 0.05 mg/1 of total phosphorus for the growth of algae. Since Thompson Lake has a storage capacity of approximately 200 acre-feet, the total amount per application should be about 60 lbs TSP. This is a rate of about 3 lbs per surface acre.

Since 100 lb. applications of TSP were used in 1981, there is probably enough phosphorus in the lake sediments from the treatment in 1981 to be recycled in the future and sustain algal blooms which will shade out weeds and concentrate the fish. If the fertilization is continued, the lake will continue to undergo rapid eutrophication. Some eutrophication may be good; however, the symptoms of advanced eutrophication, such as dissolved oxygen depletion, stress conditions, greatly reduced fish habitat and taste and odor, are probably not what is desired for the lake.

It is recommended that future treatments with triple super phosphate be closely monitored and discontinued before the symptoms of advanced eutrophication are apparent. Methods of weed control such as harvesting or the use of fiberglass screens should be explored. Continued Secchi disc monitoring of this lake is recommended to determine the effectiveness of the fertilization program and evaluate water quality trends.

REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

DS:jab/sp3903C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

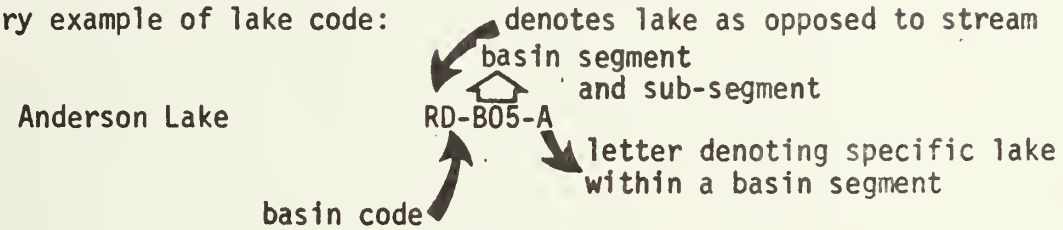
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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DIVISION OF WATER POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

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THUNDERBIRD LAKE / PUTNAM CO.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

LAKE THUNDERBIRD, PUTNAM COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Lake Thunderbird is a 113 acre impoundment owned by the Lake Thunderbird Organization, Putnam County, Illinois. The lake, which constructed by damming Senachwine Creek in 1979, has a maximum depth of 60 feet, an average depth of 35 feet and a storage capacity of 3,951 acre-feet (Table 1).

Lake Thunderbird serves as a recreational and agricultural water supply lake. Recreational uses include fishing, swimming, power boating, row boating or canoeing and picnicking. Access is available to organization members only.

The 16,000 acre watershed of Lake Thunderbird is 70 percent row crops, while the shoreline is 60 percent residential.

Algal blooms and aquatic weeds are considered slight problems for Lake Thunderbird. Urban storm drainage and cropland runoff are cited as potential pollution sources.

Assessment information of Lake Thunderbird was provided by the Illinois Department of Conservation (1977). Monitoring was performed by James Van Alstin. Secchi disc depths, total depths and field observations were recorded at three sites (located in Fig. 1) or June 12, 1981.

ABLE 1. LAKE ASSESSMENT SUMMARY, LAKE THUNDERBIRD, PUTNAM COUNTY, ILLINOIS (SD-B03-Q).

I. GENERAL INFORMATION

River Basin: Illinois
Segment: B02

Ownership: Organizational

Surface Area (Acres): 112.9
Watershed Area (Acres): 16,000
Maximum Depth (Feet): 60
Average Depth (Feet): 35
Storage Capacity (Acre/Feet):3,951
Inflowing Stream(s):
Outflowing Stream(s): Senachwine
Water Retention Time: 0.370
Lake Type: Dammed Stream
Year Constructed: 1970

I. USAGE

Public Access: no
Lake Usage:
Potable Water Supply:
Industrial Water Supply:
Agricultural Water Supply: X
Cooling Water:
Recreation:
Fishing: X
Swimming: X
Power Boating: X
Row Boating or Canoeing: X
Sailboating:
Camping:
Picnicking: X
Waterfowl Hunting:
Waterfowl Observation:
Other:

Recreational Facilities:
_____
_____
_____

Shoreline Usage (Percent):
Urban (Including Streets):
Residential (Including Lawns): 60
Golf Courses:
Pasture or Grassland: 10
Woodland: 10
Row Crops:20
Wetland:
Other:

Watershed Usage (Percent):
Urban:
Residential: 10
Golf Courses:
Pasture or Grassland: 5
Woodland: 10
Row Crops: 70
Wetland:
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: excellent
Fishing:
Conditions and Extent:
Suspended Sediment: minimal
Deposition of Sediment: minimal
Algal Blooms: slight
Aquatic Weeds: slight
Taste and/or Odor: minimal
Water Level Fluctuation: minimal
Fishkills: minimal
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage: X
Septic Tanks:
Pasture or Grassland Runoff:
Cropland Runoff: X
Feedlot Runoff:
Construction Site Runoff:
Fertilizer or Pesticides from Lawns/Golf Courses:
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl:
Sediment in Lake:
Other:

V. LAKE MANAGEMENT

Comments:_____
_____
_____
_____
_____

Information Supplied By Illinois Department of Conservation (1977)

FIGURE 1

LAKE THUNDERBIRD

PUTNAM COUNTY

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Lake Thunderbird are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Lake Thunderbird

The average Secchi disc transparency of Lake Thunderbird was 46 inches, which ranked number 28 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was slightly less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Lake Thunderbird ranged from a minimum of 36 inches at Site 3 to a maximum of 54 inches at Site 1. Secchi readings were below the four feet minimum recommended for swimming at Site 3.

A spatial trend of increasing transparency from the lake headwaters (Site 3) to the dam (Site 1), as is typical of Illinois reservoirs, was apparent in Lake Thunderbird on June 12.

Field observations indicate that the lower transparency at Site 3 was due to higher amounts of suspended sediment caused by heavy rains, which fell twenty-four hours prior to the sampling. This sediment load tends to settle out in the upper end of the lake so that the water becomes clearer towards the dam, as evidenced by the change in water color from brown at Site 3 to green at Site 1.

Since Secchi readings were taken on only one date, seasonal differences in the transparency of Lake Thunderbird could not be determined.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) THUNDERBIRD/PUTNAM COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
06/ 12	54.0	48.0	36.0	46.0	9.2

SUMMARY STATISTICS

	SITES			LAKE
MEAN	54.0	48.0	36.0	46.0
STD DEV	-1.0	-1.0	-1.0	9.2
MIN	54.0	48.0	36.0	36.0
MAX	54.0	48.0	36.0	54.0
AV DEPTH	60.0	27.0	12.0	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) THUNDERBIRD/PUTNAM COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
06/ 12	60.0	27.0	12.0	33.0	24.6

SUMMARY STATISTICS

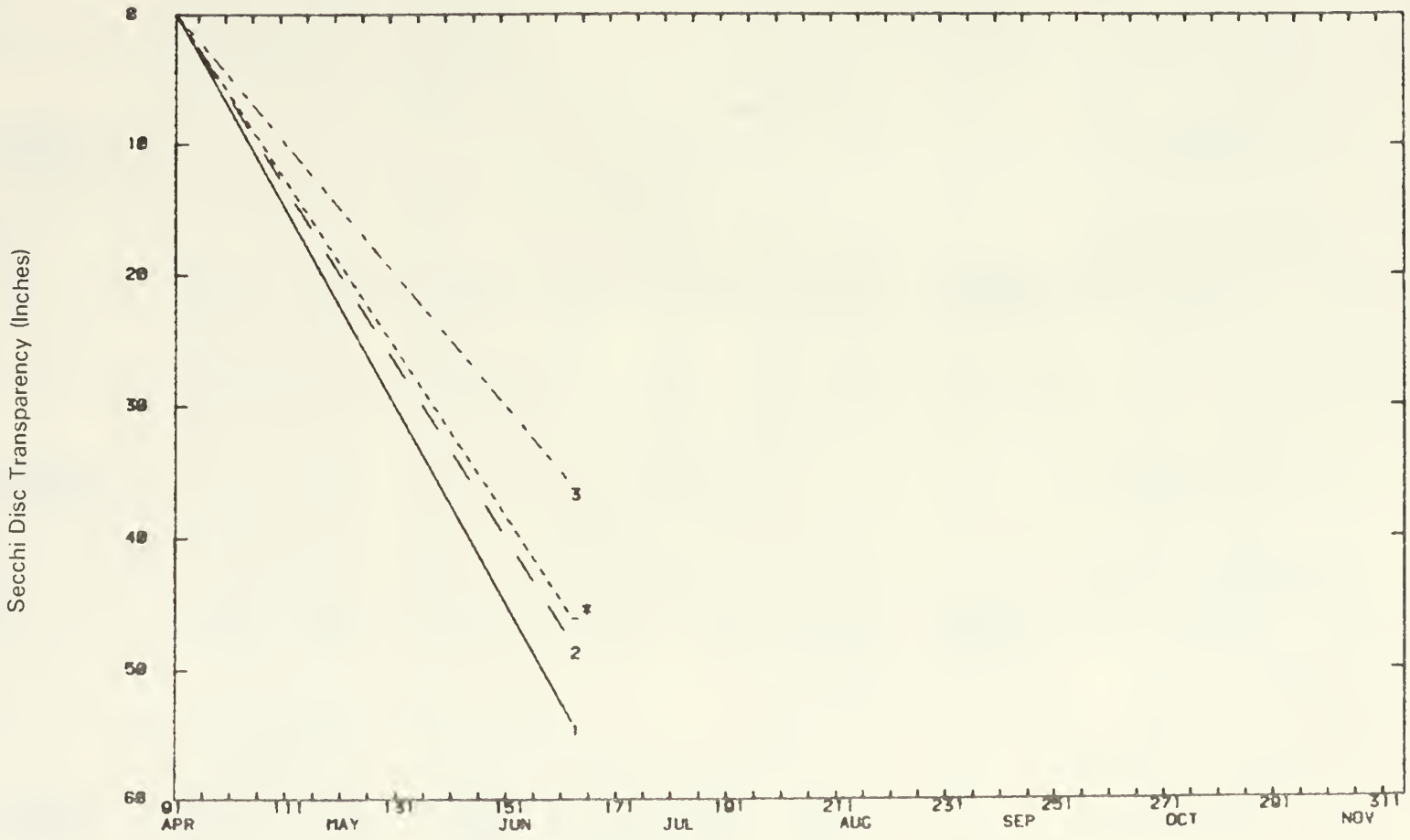
	SITES			LAKE
MEAN	60.0	27.0	12.0	33.0
STD DEV	-1.0	-1.0	-1.0	24.6
MIN	60.0	27.0	12.0	12.0
MAX	60.0	27.0	12.0	60.0
AV DEPTH	60.0	27.0	12.0	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) THUNDERBIRD/PUTNAM COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



KEY

1 Site 1
2 Site 2
3 Site 3
* Mean (Average)

TABLE 4. FIELD OBSERVATIONS, THUNDERBIRD LAKE, PUTNAM COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/12/81	WATER COLOR:	lt. green	lt. green	lt. brown
	SEDIMENT:	minimal	minimal	slight
	ALGAE:	minimal	minimal	slight
	WEEDS AT SAMPLE SITE:	minimal	minimal	slight
	WEEDS NEAR SHORE:	minimal	minimal	slight
	OTHER SUBSTANCES:	none	none	algal mats
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	many clouds	many clouds
PRECIPITATION:	no rain	heavy rain
WAVES:	ripple	moderate
AIR TEMPERATURE:	hot	cool
WIND DIRECTION:	N	N
OBSERVATIONS MADE BY:		

OTHER COMMENTS	
WATER LEVEL OF LAKE:	10" above normal
RECREATIONAL USAGE:	none
LAKE MANAGEMENT:	
ADDITIONAL COMMENTS:	

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
	WATER COLOR:			
	SEDIMENT:			
	ALGAE:			
	WEEDS AT SAMPLE SITE:			
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:			
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:		
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		
OBSERVATIONS MADE BY:		

OTHER COMMENTS	
WATER LEVEL OF LAKE:	
RECREATIONAL USAGE:	
LAKE MANAGEMENT:	
ADDITIONAL COMMENTS:	

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
	WATER COLOR:			
	SEDIMENT:			
	ALGAE:			
	WEEDS AT SAMPLE SITE:			
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:			
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:		
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		
OBSERVATIONS MADE BY:		

OTHER COMMENTS	
WATER LEVEL OF LAKE:	
RECREATIONAL USAGE:	
LAKE MANAGEMENT:	
ADDITIONAL COMMENTS:	

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
	WATER COLOR;			
	SEDIMENT:			
	ALGAE:			
	WEEDS AT SAMPLE SITE:			
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:			
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:		
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		
OBSERVATIONS MADE BY:		

OTHER COMMENTS	
WATER LEVEL OF LAKE:	
RECREATIONAL USAGE:	
LAKE MANAGEMENT:	
ADDITIONAL COMMENTS:	

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Lake Thunderbird (estimated at twice the Secchi depth) was 9.0 feet at Site 1, 8.0 feet at Site 2, 6.0 feet at Site 3. Since Lake Thunderbird is deep enough to thermally stratify and had a euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Lake Thunderbird, a large recreational impoundment in Putnam County, Illinois, was sampled on June 12, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer James Van Alstin recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Lake Thunderbird (46 inches) ranked 28th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). Although this average transparency was slightly less than the four feet minimum recommended for swimming by the Department of Public Health; it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Lake Thunderbird is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Lake Thunderbird is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Pollutant contributions from urban storm drainage and fertilization of lawns should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, and improve fishing. Harvesting of aquatic weeds might also be considered.

Continued monitoring is recommended for Lake Thunderbird. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

DS:jab/sp3873C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

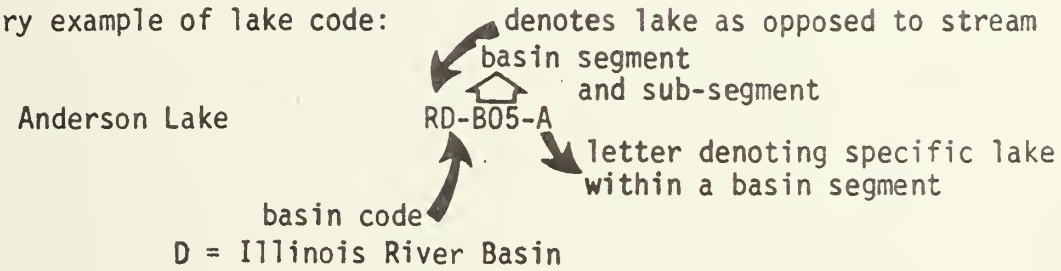
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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DIVISION OF WATER POLLUTION CONTROL
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SPRINGFIELD, ILLINOIS 62706

1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

TOWER LAKE, LAKE COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

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Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have available a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Tower Lake is a 88 acre impoundment in Tower Lakes, Lake County, Illinois. The lake is located on an unnamed tributary flowing into the Fox River. It has a maximum depth of 9 feet, an average depth of 4 feet and a storage capacity of 352 acre-feet (Table 1).

Tower Lake is a residential development lake used primarily for fishing, swimming, and power boating. Its watershed is estimated to be 50% agriculture and 50% residential. The lake shoreline is 100% residential.

Aquatic weeds and algae are considered moderate problems for Tower Lake. Agricultural runoff and sediment are considered potential pollution sources. The lake has been treated with 2,4-D, and possibly copper sulfate, to help control aquatic weeds and algae, respectively. Dye is also being used to control vegetation.

Assessment and monitoring information for Tower Lake was provided by James Halborg. Secchi disc depth, total depth and field observations were recorded at three sites (located in Figure 1) on three dates in 1981.

TABLE 1. LAKE ASSESSMENT, TOWER LAKE, LAKE COUNTY, ILLINOIS (RT-B01ZF)

I. GENERAL INFORMATION

River Basin: Fox
Segment: B01

Ownership: Village of Tower Lakes

Surface Area (Acres): 88
Watershed Area (Acres):
Maximum Depth (Feet): 9
Average Depth (Feet): 4
Storage Capacity (Acre/Feet): 352
Inflowing Stream(s): unnamed tributary from Timber L.
Outflowing Stream(s):
Water Retention Time:
Lake Type: dammed stream
Year Constructed:

II. USAGE

Public Access:
Lake Usage:
- Potable Water Supply:
- Industrial Water Supply:
- Agricultural Water Supply:
- Cooling Water:
- Recreation:
  - Fishing: moderate
  - Swimming: moderate
  - Power Boating: moderate
  - Row Boating or Canoeing:
  - Sailboating:
  - Camping:
  - Picnicking:
  - Waterfowl Hunting:
  - Waterfowl Observation:
  - Other:

Recreational Facilities:

_____
_____
_____

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns): 100%
- Golf Courses:
- Pasture or Grassland:
- Woodland:
- Row Crops:
- Wetland:
- Other:

Watershed Usage (Percent):
- Urban:
- Residential: 50%
- Golf Courses:
- Pasture or Grassland:
- Woodland:
- Row Crops: 50%
- Wetland:
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair
Fishing: fair
Conditions and Extent:
- Suspended Sediment:
- Deposition of Sediment:
- Algal Blooms: moderate
- Aquatic Weeds: moderate
- Taste and/or Odor:
- Water Level Fluctuation:
- Fishkills:
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage:
- Septic Tanks:
- Pasture or Grassland Runoff: X
- Cropland Runoff: X
- Feedlot Runoff:
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses:
- Orchards:
- Forestry Operations Runoff:
- Mining:
- Waterfowl:
- Sediment in Lake: X
- Other:

V. LAKE MANAGEMENT

Comments: Treated with 2, 4-D and copper sulfate to control aquatic weeds and algae. Dye is used to reduce transparency to control vegetation.

Information Supplied By Jim Halborg (1981)

FIGURE 1

TOWER LAKE

LAKE COUNTY

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field obervations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes".

The Secchi monitoring data for Tower Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3 while field observations are summarized in Table 4.

Transparency of Tower Lake

The average Secchi disc transparency of Tower Lake was 24.7 inches, which ranked number 55 when the average transparencies of the lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Spatial and Seasonal Differences in Transparency

Secchi disc measurements for Tower Lake ranged from a minimum of 19 inches at Site 3 on April 11 to a maximum of 30 inches at Sites 1 and 2 on May 31.

Average clarity was relatively uniform at Sites 1 and 2, while it was slightly lower at Site 3. The average transparencies were 26.0 inches, 26.3 inches and 21.7 inches at Sites 1, 2, and 3, respectively. Readings at all the sites were below the four feet minimum recommended for swimming on all sampling dates. The low Secchi readings at the sites were probably related, in part, to the shallow depths (average depths were 7.3 feet at Site 1, 7.8 feet at Site 2 and 4.3 feet at Site 3), which allowed wind and wave activity to resuspend the bottom sediment.

Seasonal differences in the transparency could not be ascertained because samples were taken only during April and May.

Relationship to Lake Uses

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) TOWER/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 11	27.0	27.0	19.0	24.3	4.6
04/ 25	21.0	22.0	22.0	21.7	0.6
05/ 31	30.0	30.0	24.0	28.0	3.5

SUMMARY STATISTICS

	SITES			LAKE
MEAN	26.0	26.3	21.7	24.7
STD DEV	4.6	4.0	2.5	4.0
MIN	21.0	22.0	19.0	19.0
MAX	30.0	30.0	24.0	30.0
AV DEPTH	7.3	7.8	4.3	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) TOWER/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 11	8.0	7.5	5.0	6.8	1.6
04/ 25	7.2	8.0	4.0	6.3	2.1
05/ 31	7.8	8.0	4.0	6.3	2.1

SUMMARY STATISTICS

	SITES			LAKE
MEAN	7.3	7.8	4.3	6.5
STD DEV	0.6	0.3	0.6	1.7
MIN	7.0	7.5	4.0	4.0
MAX	8.0	8.0	5.0	8.0
AV DEPTH	7.3	7.8	4.3	

-1 = missing values

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) TOWER/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

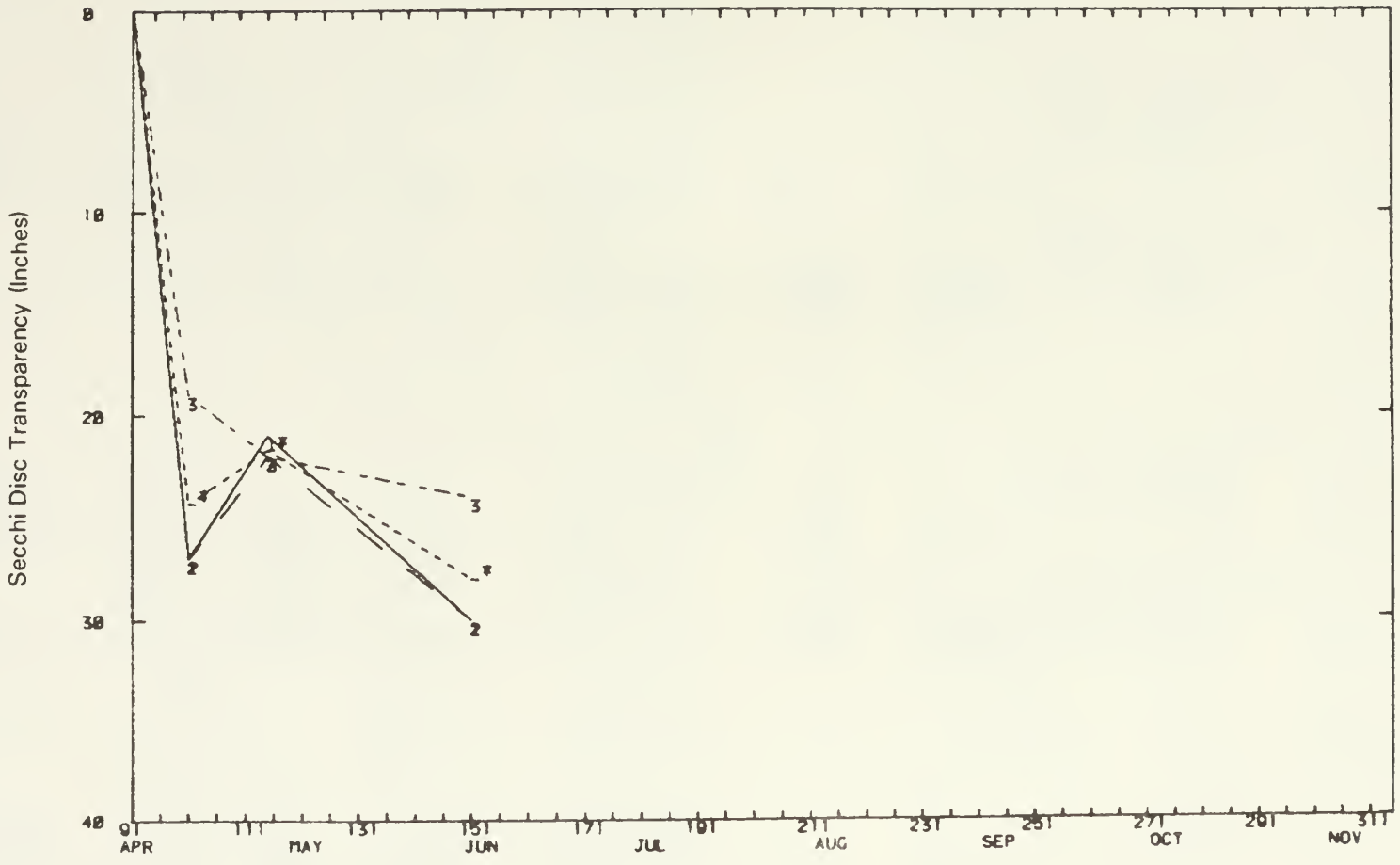


TABLE 4. FIELD OBSERVATIONS, TOWER LAKE, LAKE COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
4-11-81	WATER COLOR:	very brn.	very brn.	very brn	CLOUD COVER:	many clouds	many clouds	WATER LEVEL OF LAKE: normal
	SEDIMENT:	large	large	large	PRECIPITATION:	no rain	heavy rain	RECREATIONAL USAGE: fishing
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	small	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	N.	N.	LAKE MANAGEMENT: 2,4-D
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY: Jim Halborg			ADDITIONAL COMMENTS: weed control

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
4-25-81	WATER COLOR:	very brn	very brn.	very brn.	CLOUD COVER:	many clouds	many clouds	WATER LEVEL OF LAKE:
	SEDIMENT:	large	large	large	PRECIPITATION:	no rain		RECREATIONAL USAGE:
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	ripple	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	hot	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	W.	W.	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY: Jim Halborg			ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
5-31-81	WATER COLOR:	very brn.	very brn.	very brn.	CLOUD COVER:	clear		WATER LEVEL OF LAKE:
	SEDIMENT:	large	large	large	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE:
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	clam	
	WEEDS AT SAMPLE SITE:	moderate	minimal	minimal	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	S.W.	S.W.	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY: Jim Halborg			ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPEPATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Tower Lake (estimated at twice the Secchi depth) ranged from 4 - 5 feet at Sites 1 and 2, and 2 - 3 feet at Site 3. Since these euphotic zones were generally less than the total depths, low oxygen may be expected in the bottom waters.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron and managanese are released from the sediments and accumulate in the bottom waters. When these substances become available to the surface waters during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Tower Lake, a residential development lake in northeastern Illinois, was sampled on three dates between April 11 and May 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Jim Halborg recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Tower Lake was 24.7 inches, which ranked 55th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest, 87 is least transparent). Although this average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Tower Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information of lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in identified source areas of the watershed, particularly those closest to the lake, may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Harvesting of aquatic weeds might be considered.

Continued monitoring is recommended for Tower Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake watershed management strategies.

REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

DS:jab/sp4563C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

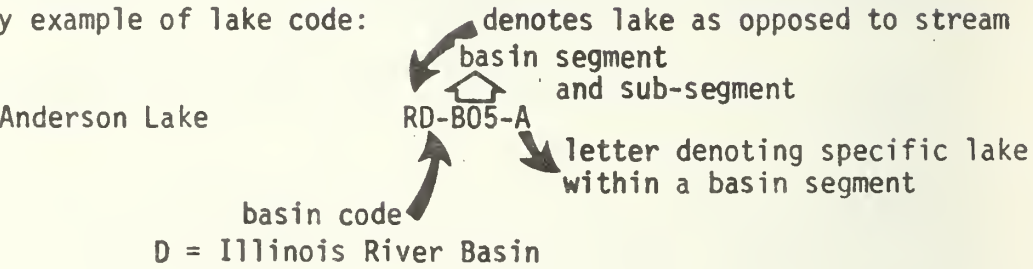
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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the State of Illinois
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Nat. Hist. Surv.

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DIVISION OF WATER POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

TOWER LAKE, MADISON COUNTY, ILLINOIS

A Cooperative Citizen-
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

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Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the volunteer data. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Tower Lake, a 77 acre impoundment owned by Southern Illinois University, is located in Madison County, 2.5 miles southwest of Edwardsville. Constructed by damming an unnamed creek in 1964, Tower Lake has a maximum depth of 30 feet, an average depth of 17 feet and a storage capacity of 1309 acre-feet (Table 1).

Tower Lake serves as a recreational lake used for swimming, row boating and canoeing, sailboating, picnicking, waterfowl observation and fishing. Access is unlimited, but a fee is charged.

The 700 acre watershed of Tower Lake is primarily residential. The lake shoreline is primarily residential, woodland, and campus housing.

Suspended sediment, deposition of sediment and algal blooms are considered substantial problems for Tower Lake in late summer. Aquatic weeds are considered moderate problems. Sewage treatment plant effluent is cited as the major pollution source. An aeration system is installed in the lake and copper sulfate is routinely used to control algal blooms.

Assessment information on Tower Lake was provided by Ann Schonlau. Monitoring was performed by Ann Schonlau and Michael Oexner. Secchi disc depth, total depth, and field observations were recorded at three sites (located in Fig. 1) on six dates in 1981.

TABLE 1. LAKE ASSESSMENT, TOWER LAKE, MADISON COUNTY, ILLINOIS (RJ-A02-0).

I. GENERAL INFORMATION

River Basin: Mississippi South Central
Segment: A02

Ownership: SIU Edwardsville

Surface Area (Acres): 77
Watershed Area (Acres): 700
Maximum Depth (Feet): 30
Average Depth (Feet): 17
Storage Capacity (Acre/Feet): 1309
Inflowing Stream(s): Unnamed Creek
Outflowing Stream(s): Cahokia Creek
Water Retention Time:
Lake Type: dammed stream
Year Constructed: 1964

II. USAGE

Public Access: yes - fee charge
Lake Usage:
- Potable Water Supply: none
- Industrial Water Supply: light
- Agricultural Water Supply: none
- Cooling Water: moderate
- Recreation: moderate
  - Fishing: light
  - Swimming: heavy
  - Power Boating: none
  - Row Boating or Canoeing: heavy
  - Sailboating: heavy
  - Camping: none
  - Picnicking: heavy
  - Waterfowl Hunting: none
  - Waterfowl Observation: moderate
  - Other:

Recreational Facilities:
beach, boat launch, picnic area, concessions

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns):
- Golf Courses:
- Pasture or Grassland:
- Woodland:
- Row Crops:
- Wetland:
- Other: campus housing

Watershed Usage (Percent):
- Urban:
- Residential:
- Golf Courses:
- Pasture or Grassland:
- Woodland:
- Row Crops:
- Wetland:
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair - poor
Fishing: poor
Conditions and Extent:
- Suspended Sediment: large - in late summer
- Deposition of Sediment: large - in late summer
- Algal Blooms: large - in late summer
- Aquatic Weeds: moderate
- Taste and/or Odor: slight
- Water Level Fluctuation: minimal
- Fishkills: minimal
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent: yes
- Industrial Discharge:
- Urban Storm Drainage:
- Septic Tanks:
- Pasture or Grassland Runoff:
- Cropland Runoff:
- Feedlot Runoff:
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses:
- Orchards:
- Forestry Operations Runoff:
- Mining:
- Waterfowl:
- Sediment in Lake:
- Other:

V. LAKE MANAGEMENT

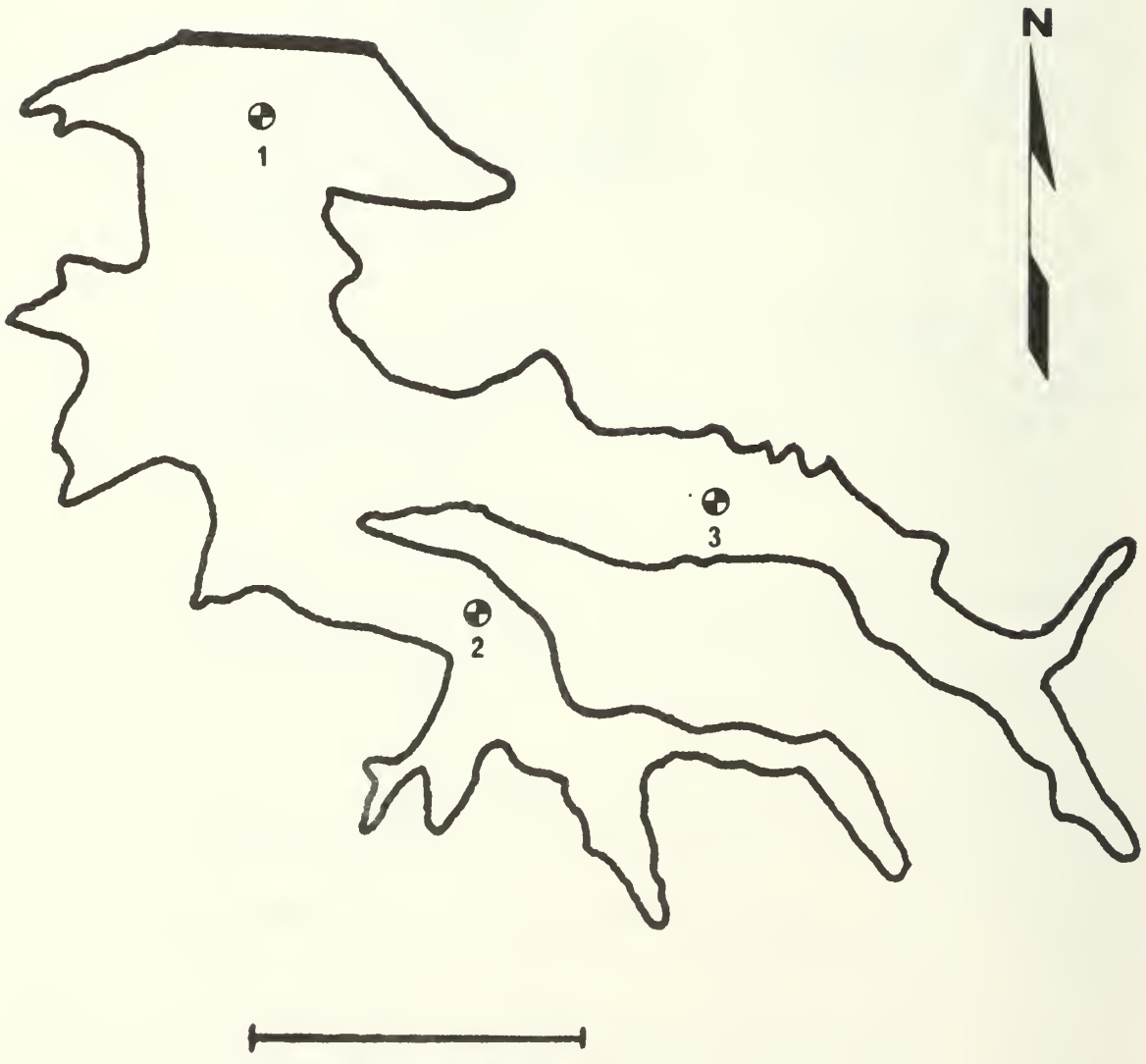
Comments: CUSO4 and aeration

Information Supplied By Ann Schonlau (1981)

FIGURE 1

TOWER LAKE

MADISON COUNTY



RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes."

The Secchi monitoring data for Tower Lake are summarized in Table 2 and plotted in Fig. 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Tower Lake

The average Secchi disc transparency of Tower Lake was 45.1 inches, which ranked 32nd when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was almost equal to the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976).

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Tower Lake ranged from a maximum of 54 inches at Site 3 on July 21 to a minimum of 36 inches at Sites 1 and 2 on August 18.

Clarity was relatively uniform at all three sites on Tower Lake. Transparency averaged 44.2 inches, 44.5 inches and 46.5 inches at Sites 1, 2 and 3, respectively. The uniformity of the Secchi readings can be attributed, in part, to the lack of shallow depths at any of the sites; the average depths of Sites 1, 2 and 3 were 25.8 feet, 17.5 feet and 19.3 feet, respectively. Secchi readings greater than or equal to the four feet minimum recommended for swimming were found at one or more sites on all sampling dates except August 18.

Because data was not collected in May, June, September and October, seasonal differences could not be accurately determined. The highest transparencies were found on May 21 and July 21, while the lowest were found on August 18.

The transparency of Tower Lake is influenced primarily by the presence of algae, as evidenced by a green water color and the treatment of the lake with copper sulfate for algal control.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) TOWER/MADISON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 21	48.0	45.0	51.0	48.0	3.0
07/ 16	43.0	48.0	42.0	44.3	3.2
07/ 21	48.0	48.0	54.0	50.0	3.5
07/ 29	42.0	48.0	42.0	44.0	3.5
07/ 30	48.0	42.0	48.0	46.0	3.5
08/ 18	36.0	36.0	42.0	38.0	3.5

SUMMARY STATISTICS

	SITES			LAKE
MEAN	44.2	44.5	46.5	45.1
STD DEV	4.8	4.8	5.3	4.8
MIN	36.0	36.0	42.0	36.0
MAX	48.0	48.0	54.0	54.0
AV DEPTH	25.8	17.5	19.3	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) TOWER/MADISON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 21	16.5	13.5	17.0	15.7	1.9
07/ 16	33.0	17.0	19.5	23.2	8.6
07/ 21	31.5	16.5	14.0	20.7	8.5
07/ 29	26.0	21.0	22.5	23.2	2.6
07/ 30	23.0	17.0	22.0	20.7	3.2
08/ 18	24.5	20.0	20.5	21.7	2.6

SUMMARY STATISTICS

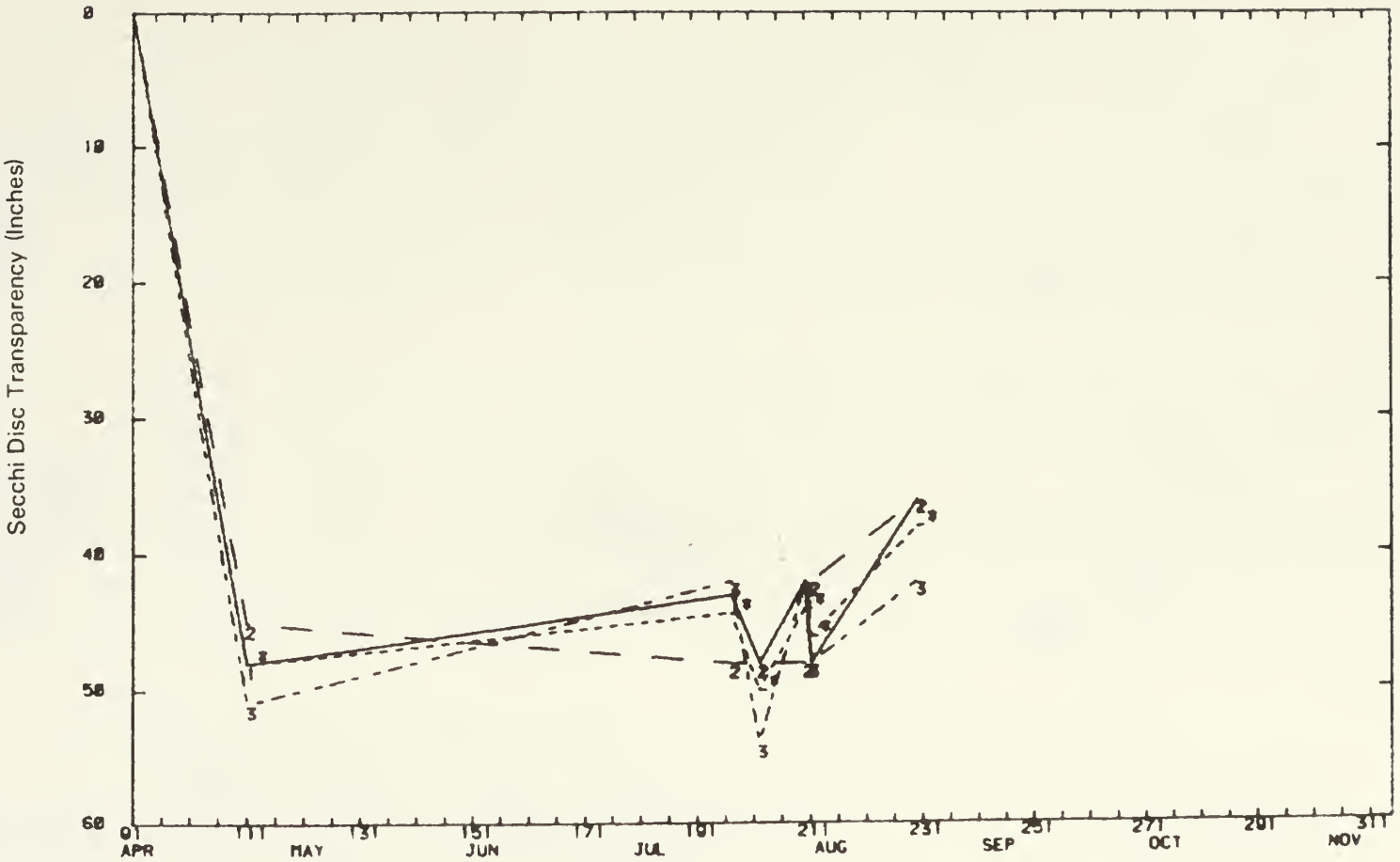
	SITES			LAKE
MEAN	25.8	17.5	19.3	20.8
STD DEV	6.0	2.7	3.2	5.4
MIN	16.5	13.5	14.0	13.5
MAX	33.0	21.0	22.5	33.0
AV DEPTH	25.8	17.5	19.3	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) TOWER/MADISON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



KEY

1 Site 1
2 Site 2
3 Site 3
* Mean (Average)

TABLE 4. FIELD OBSERVATIONS, TOWER LAKE, MADISON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
4/27/81	WATER COLOR:	lt. green	lt. green	lt. green	CLOUD COVER:	clear	overcast	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: sailing
	ALGAE:	moderate	moderate	moderate	WAVES:	ripple	ripple	row boating/canoeing
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	cool	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	SE	N	LAKE MANAGEMENT: none to date
	OTHER SUBSTANCES:	waterfowl sediment	waterfowl sediment	waterfowl sediment	OBSERVATIONS MADE BY:	Ann Schonlau		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/16/81	WATER COLOR:	lt. green	mod. green	grnsh-brn	CLOUD COVER:	overcast	overcast	WATER LEVEL OF LAKE: above normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	heavy rain	heavy rain	RECREATIONAL USAGE: fishing, row
	ALGAE:	slight	minimal	minimal	WAVES:	calm	calm	boating/canoeing, sailing
	WEEDS AT SAMPLE SITE:	slight	slight	slight	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	slight	moderate	minimal	WIND DIRECTION:	W	NW	LAKE MANAGEMENT: 5/27 copper sulfate
	OTHER SUBSTANCES:	none	waterfowl	none	OBSERVATIONS MADE BY:	Ann Schonlau		ADDITIONAL COMMENTS: Rained date of sample
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/21/81	WATER COLOR:	very green	mod. green	mod. green	CLOUD COVER:	clear	many clouds	WATER LEVEL OF LAKE: above normal 12"
	SEDIMENT:	minimal	minimal	slight	PRECIPITATION:	no rain	heavy rain	RECREATIONAL USAGE: fishing, sailing,
	ALGAE:	minimal	minimal	slight	WAVES:	calm	white caps	row boating/canoeing, picnicking
	WEEDS AT SAMPLE SITE:	minimal	minimal	slight	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	moderate	slight	moderate	WIND DIRECTION:	NW	NW	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	waterfowl	floating branches	OBSERVATIONS MADE BY:	Michael Oexner		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/29/81	WATER COLOR:	grnsh-brn	mod. green	very green	CLOUD COVER:	many clouds	many clouds	WATER LEVEL OF LAKE: above normal
	SEDIMENT:	minimal	minimal	slight	PRECIPITATION:	no rain	v. lt. rain	RECREATIONAL USAGE: fishing, row
	ALGAE:	minimal	minimal	slight	WAVES:	calm	moderate	boating/canoeing, sailing
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	moderate	moderate	slight	WIND DIRECTION:	NW		LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none	OBSERVATIONS MADE BY:	Michael Oexner		ADDITIONAL COMMENTS:
	ODOR:	fishy	no odor	no odor				

TABLE 4. FIELD OBSERVATIONS, TOWER LAKE, MADISON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
7/30/81	WATER COLOR:	clear	mod. green	clear
	SEDIMENT:	minimal	slight	minimal
	ALGAE:	minimal	slight	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	slight	slight
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	musty	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	few clouds	many clouds
PRECIPITATION:	no rain	no rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	NW	SE

OBSERVATIONS MADE BY: Mike Oexner

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing, canoeing, sailing

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
8/18/81	WATER COLOR:	mod. green	mod. green	lt. green
	SEDIMENT:	minimal	minimal	slight
	ALGAE:	minimal	minimal	slight
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	moderate	moderate	slight
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	musty

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	many clouds	many clouds
PRECIPITATION:	no rain	no rain
WAVES:	moderate	moderate
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	NW	E

OBSERVATIONS MADE BY: Mike Oexner

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE: fishing, sailing, row boating/canoeing

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
	WATER COLOR:			
	SEDIMENT:			
	ALGAE:			
	WEEDS AT SAMPLE SITE:			
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:			
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:		
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		

OBSERVATIONS MADE BY:

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE:

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
	WATER COLOR:			
	SEDIMENT:			
	ALGAE:			
	WEEDS AT SAMPLE SITE:			
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:			
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:		
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		

OBSERVATIONS MADE BY:

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE:

LAKE MANAGEMENT:

ADDITIONAL COMMENTS.

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Tower Lake (estimated at twice the Secchi depth) ranged from 6-8 feet at Site 1, 6-8 feet at Site 2, and 7-9 feet at Site 3. In recognition of the problems resulting from dissolved oxygen depletion, Tower Lake is presently being aerated to increase the oxygen concentration.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Tower Lake, a small, relatively deep recreational impoundment located on the campus of Southern Illinois University - Edwardsville, was sampled on six dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers Ann Schonlau and Michael Oexner recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Tower Lake (45.1 inches) ranked 32nd of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was slightly less than the four feet minimum recommended for swimming by the Department of Public Health but was in the normal range for Illinois lakes and compatible with most recreational uses. Field observations indicated that the transparency of Tower Lake was influenced primarily by the presence of algae.

Tower Lake is undergoing the process of eutrophication as evidenced by transparency readings and field observations of algae, weed, and sediment

problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of portions of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from sewage treatment plant effluent, fertilization of lawns, and waterfowl should also be investigated and minimized.

Continued in-lake management may be helpful. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem causing blue-greens and improve fishing. Harvesting of aquatic weeds or use of aquatic screens might also be considered.

Continued monitoring is recommended for Tower Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake watershed management strategies.

REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

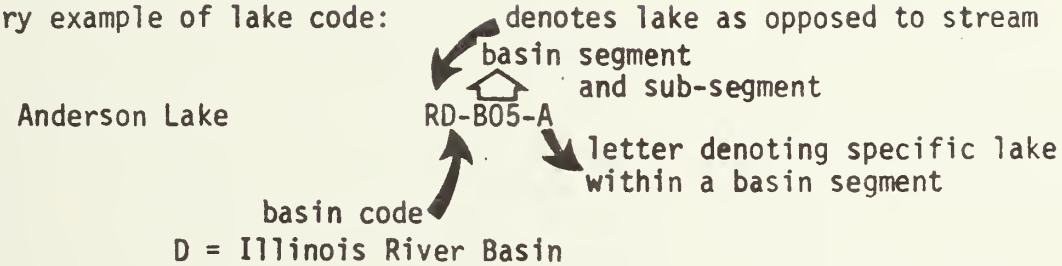
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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Printed by authority of
the State of Illinois
Job # 11502 6/82 50

551.482
V889x
1981:80
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Nat. Hist. Surv.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
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1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

VALLEY LAKE, COOK COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Valley Lake is a 4 acre impoundment located in Cook County, 3 miles southwest of Palatine, Illinois is owned by Mr. T. J. Westerberg. The lake, constructed by the damming of an unnamed creek in 1946, is one of three lakes in a basin. It has a maximum depth of 9 feet, an average depth of 5 feet and a storage area of 20 acre-feet (Table 1).

Valley Lake serves as a recreational lake. Waterfowl observation is the greatest use of the lake. Access is limited to residents of the 80-acre subdivision.

The 500 acre watershed of Valley Lake is estimated to be entirely residential. The lake shoreline is also entirely residential.

Aquatic weeds are considered a substantial problem for Valley Lake. Deposition of sediment and algal blooms are considered moderate problems. Urban storm drainage, pasture or grassland runoff, waterfowl and sediment in the lake are cited as potential pollution sources.

Assessment and monitoring information on Valley Lake was provided by T. J. Westerberg, lake owner. Secchi disc depth, total depth and field observations were recorded at three sites (located in Fig. 1) on four dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, VALLEY LAKE, COOK COUNTY, ILLINOIS (RG-B02ZN).

I. GENERAL INFORMATION

River Basin: Des Plaines
Segment: B02

Ownership: T. J. Westerberg

Surface Area (Acres): 4
Watershed Area (Acres): 500
Maximum Depth (Feet): 9
Average Depth (Feet): 5
Storage Capacity (Acre/Feet): 20
Inflowing Stream(s):
Outflowing Stream(s): Tributary to Salt Creek
Water Retention Time:
Lake Type: dammed stream
Year Constructed: 1946

II. USAGE

Public Access: no
Lake Usage:
- Potable Water Supply: none
- Industrial Water Supply: none
- Agricultural Water Supply: none
- Cooling Water: none
- Recreation:
  - Fishing: light
  - Swimming: none
  - Power Boating: none
  - Row Boating or Canoeing: none
  - Sailboating: none
  - Camping: none
  - Picnicking: none
  - Waterfowl Hunting: none
  - Waterfowl Observation: moderate
  - Other:

Recreational Facilities:
none

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns): 100%
- Golf Courses:
- Pasture or Grassland:
- Woodland:
- Row Crops:
- Wetland:
- Other:

Watershed Usage (Percent):
- Urban:
- Residential: 100%
- Golf Courses:
- Pasture or Grassland:
- Woodland:
- Row Crops:
- Wetland:
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing: fair
Conditions and Extent:
- Suspended Sediment: minimal
- Deposition of Sediment: moderate
- Algal Blooms: moderate
- Aquatic Weeds: large
- Taste and/or Odor: minimal
- Water Level Fluctuation: minimal
- Fishkills: minimal
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage: yes
- Septic Tanks:
- Pasture or Grassland Runoff: yes
- Cropland Runoff:
- Feedlot Runoff:
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses:
- Orchards:
- Forestry Operations Runoff:
- Mining:
- Waterfowl: yes
- Sediment in Lake: yes
- Other:

V. LAKE MANAGEMENT

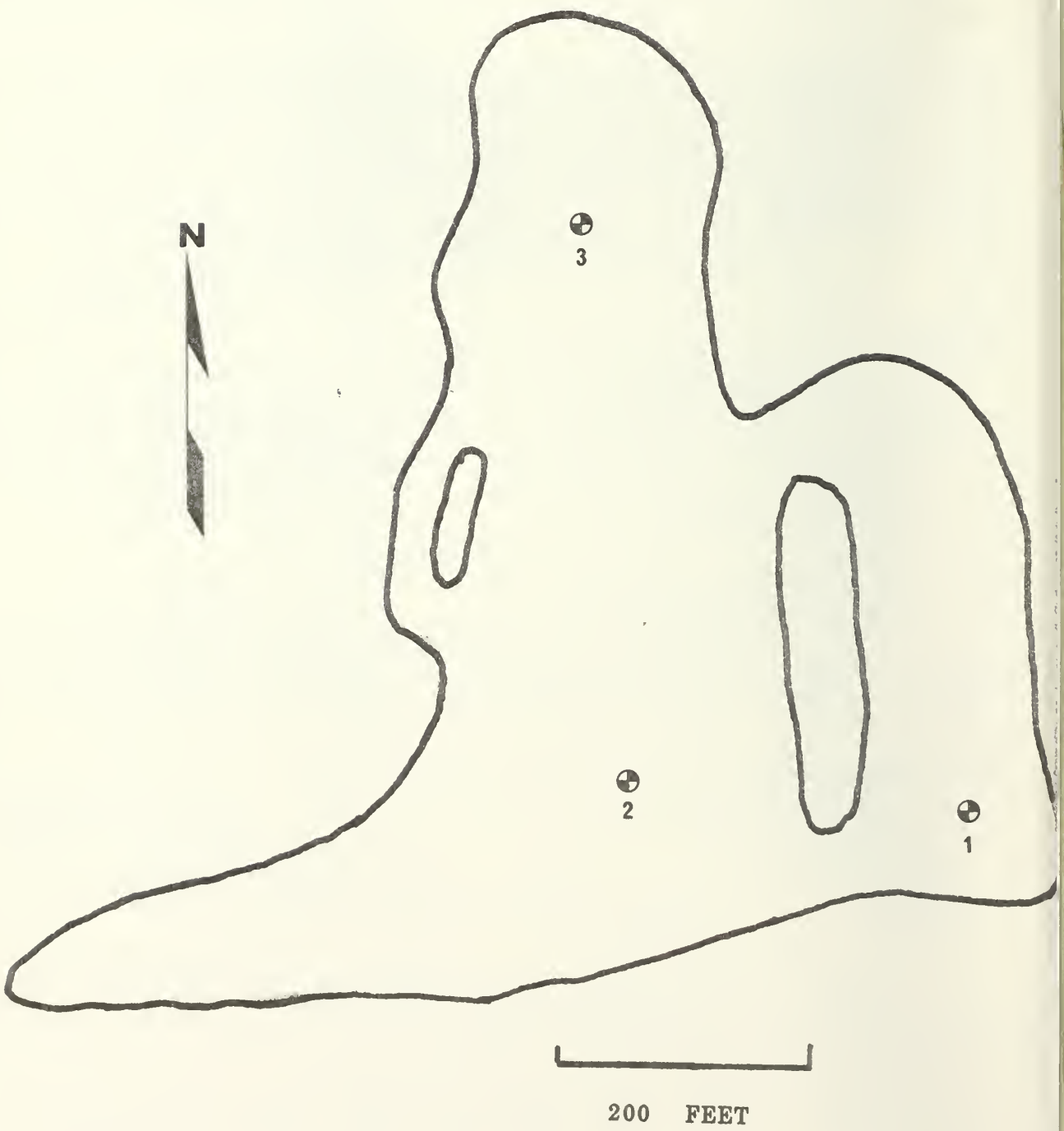
Comments: 1978 - Total fish kill initiated by the Ill. Dept. of Conservation Div. of Fisheries to rid lake of carp.

Information Supplied By T. J. Westerberg (1981)

FIGURE 1

VALLEY LAKE

COOK COUNTY



RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Valley Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Valley Lake

The average Secchi disc transparency of Valley Lake was 48.3 inches, which ranked number 23 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was slightly greater than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was above average for Illinois lakes.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Valley Lake ranged from a minimum of 30 inches at Site 3 on June 16 to a maximum of 66 inches at Site 3 on May 21. Secchi readings were below the four feet minimum recommended for swimming on June 16 and August 1.

Differences in clarity were evident in different sections of Valley Lake. Transparency averaged 45.8 inches, 52.5 inches, and 46.5 inches at Sites 1, 2, and 3, respectively.

Secchi readings were relatively uniform at Site 1 (ranging from 42 inches to 48 inches), while they were much more variable at the other sites (ranging from 42 to 60 inches at Site 2 and from 30 to 66 inches at Site 3). The lowest transparencies were found on June 16 and were the result of increased amounts of suspended sediment caused by heavy rains which fell during the preceeding 24 hours.

Field observations indicate that the transparency of Valley Lake was influenced primarily by the presence of suspended sediment, although algae was also a considerable problem. A brown to greenish-brown water color was noted and high amounts of suspended sediment and algae were observed on several sampling dates.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) VALLEY/ COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 21	48.0	60.0	66.0	58.0	9.2
06/ 16	45.0	42.0	30.0	39.0	7.9
07/ 18	48.0	60.0	48.0	52.0	6.9
08/ 1	42.0	48.0	42.0	44.0	3.5

SUMMARY STATISTICS

	SITES			LAKE
MEAN	45.8	52.5	46.5	48.3
STD DEV	2.9	9.0	15.0	9.0
MIN	42.0	42.0	30.0	30.0
MAX	48.0	60.0	66.0	66.0
AV DEPTH	5.3	7.0	7.5	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) VALLEY/ COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 21	6.0	8.0	8.5	7.5	1.3
06/ 16	4.5	5.5	5.5	5.2	0.6
07/ 18	6.0	9.0	8.0	7.7	1.5
08/ 1	4.5	9.0	8.0	7.2	2.4

SUMMARY STATISTICS

	SITES			LAKE
MEAN	5.3	7.0	7.5	6.9
STD DEV	0.0	1.7	1.4	1.7
MIN	4.5	5.5	5.5	4.5
MAX	6.0	9.0	8.5	9.0
AV DEPTH	5.3	7.0	7.5	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) VALLEY/ COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

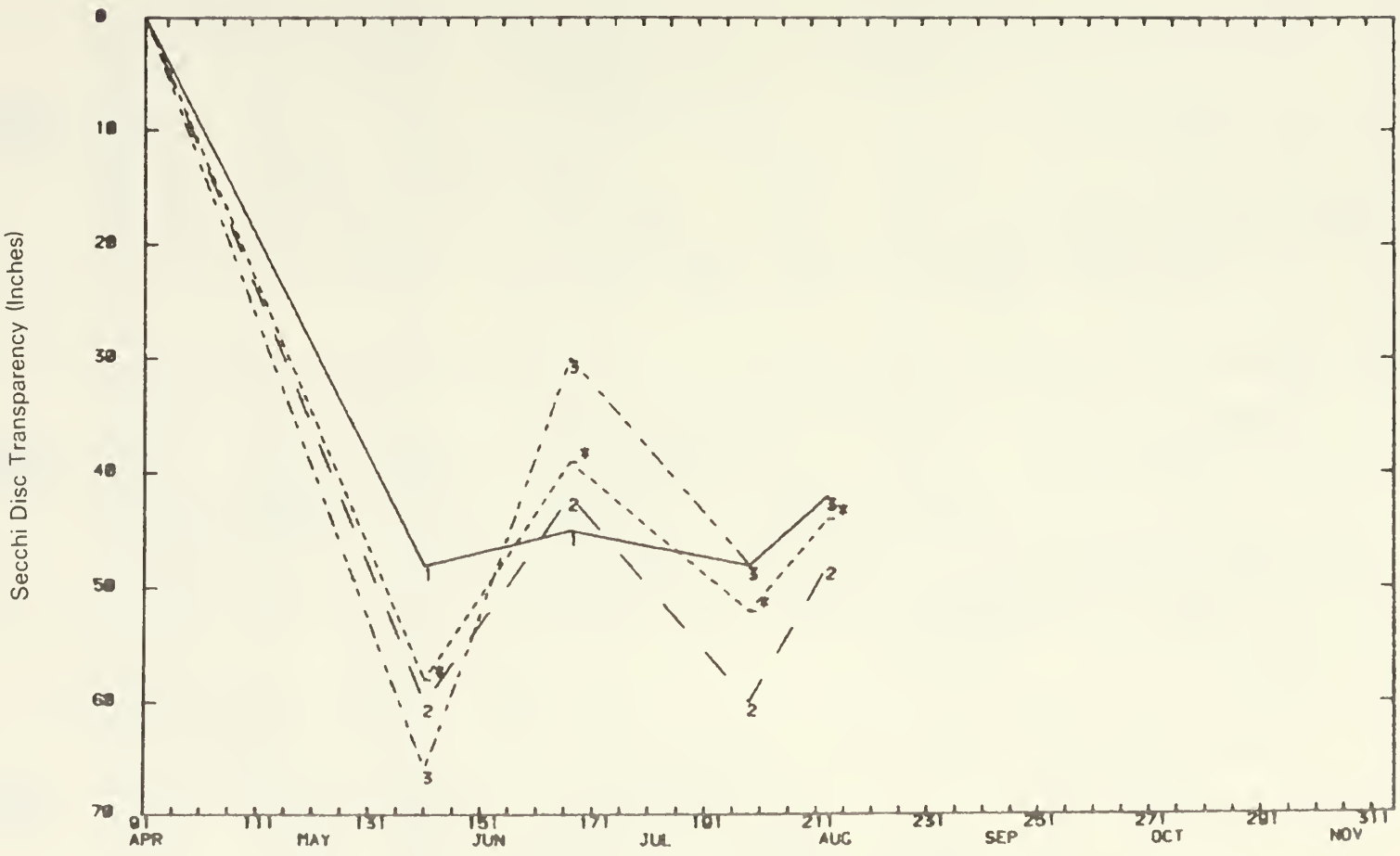


TABLE 4. FIELD OBSERVATIONS, VALLEY LAKE , COOK COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
5/21/81	WATER COLOR:	brnsh grn	brnsh - grn	brnsh - grn	CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: none
	ALGAE:	slight	slight	slight	WAVES:	ripple	ripple	
	WEEDS AT SAMPLE SITE:	moderate	moderate	moderate	AIR TEMPERATURE:	hot	warm	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	S.W.	N.	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY: T. J. Westerberg			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
6/16/81	WATER COLOR:	lt. brn	lt. brn	mod. brn.	CLOUD COVER:	few clouds	overcast	WATER LEVEL OF LAKE: 6" above normal
	SEDIMENT:	moderate	moderate	moderate	PRECIPITATION:	no rain	heavy rain	RECREATIONAL USAGE: none
	ALGAE:	moderate	moderate	slight	WAVES:	moderate	moderate	
	WEEDS AT SAMPLE SITE:	large	moderate	slight	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	W.	S.W.	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY: T. J. Westerberg			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/18/81	WATER COLOR:	grn.brn	grn- brn	grn-brn.	CLOUD COVER:	large	few clouds	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: none
	ALGAE:	large	moderate	slight	WAVES:	calm	calm	
	WEEDS AT SAMPLE SITE:	large	minimal	moderate	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	large	large	algal mats	WIND DIRECTION:	S.	S.W.	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY: T.J. Westerberg			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 21 HOURS	OTHER COMMENTS
8/1/81	WATER COLOR;	mod. brown			CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal			PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE:
	ALGAE:	minimal			WAVES:	calm	calm	
	WEEDS AT SAMPLE SITE:	slight			AIR TEMPEPATURE:	warm	warm	
	WEEDS NEAR SHORE:	minimal			WIND DIRECTION:	S.	S.	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none						
					OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:
	ODOR:							

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of tne lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Valley Lake (estimated at twice the Secchi depth) ranged from 7.0-8.0 feet at Site 1, from 7.0-10.0 feet at Site 2, from 5.0-11.0 feet at Site 3. Since the total depths of the sites were generally less than double the Secchi depths, sufficient dissolved oxygen values may be expected in the bottom waters and therefore fish would probably be found throughout the water column.

SUMMARY AND RECOMMENDATIONS

Summary

Valley Lake, a small, shallow impoundment in northeastern Illinois, was sampled on four dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer T. J. Westerberg recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Valley Lake (48.3 inches) ranked 23rd of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was slightly greater than the four feet minimum recommended for swimming by the Department of Public Health and was above average for Illinois lakes.

Valley Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from urban storm drainage and waterfowl should also be investigated and minimized. Harvesting of aquatic weeds or use of screens might also be considered.

Continued monitoring is recommended for Valley Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

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GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

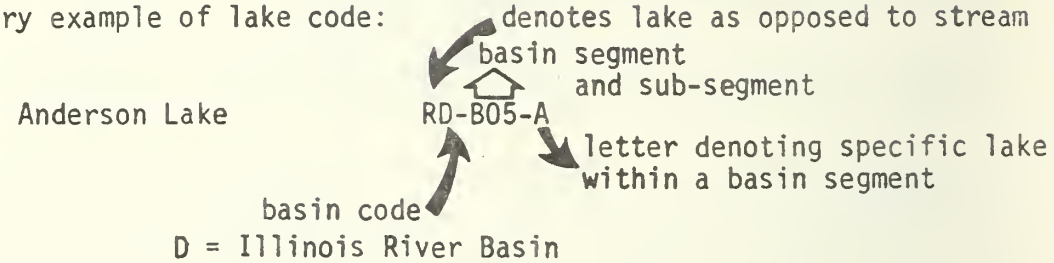
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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